



Chartiers Valley High School
Lesson Plans
 Week of 5/23/05



Instructor: Mrs. Zieger	Course: Environmental Science Period #1 ^{later}
Objective(s): The Students will...	identify & describe air & pollutants how do they or can they effect waste mgmt. & Enviro status ie: P&H
Related Curriculum Standard:	4.1.7 - Water cycle - Watersheds F-3 - Natural Hazards
Activities/Procedures: Timeline - 5 Days/1 Week	<p>Monday - Attn getter: • Students will spread out around the classroom - evenly • Teacher will open a bottle of perfume • Students will raise their hand as they smell the perfume. • Writing Prompt - Describe the pattern you observed as people raised their hands. How do you think the smell traveled across the room? Tuesday - ↓ - Discuss Intro rainwater & ACID RAIN Activity - • Collect rainwater in a clean plastic cup • Indoors dip a piece of PH paper into the cup - find the PH on the scale. • Repeat this process w/ lemon juice • How does the PH of the rainwater compare with the lemon juice? Discuss</p> <p>Wednesday - • Attn better - How can P&H's solid waste effect air & water quality? • Activity - Display containers THAT IF opened or spilled could contaminate the air or water. • Have students BRAINSTORM OTHER METHODS OF POLLUTION DISTRIBUTION</p>

Prompt ie: How could it effect soil, groundwater etc

	<p>Thursday -</p> <ul style="list-style-type: none"> • Discuss Brainstorming • Investigate on the computer how water & air pollution effect waste mgt and overall Enviro status - esp here in Pgh? • Discuss findings - back-up with actual articles. <p>Friday</p> <ul style="list-style-type: none"> • Waste Away Activity <p>Science Explorer - Prentice Hall Attached →</p>
<p>Materials(resources):</p>	<ul style="list-style-type: none"> • Science textbook • Science notebook • Science folder/portfolio • Science work packet • Science World Magazine • Writing Utensil (student owned) • Internet • CV Library • ATU video library • Teacher-made materials & resources <ul style="list-style-type: none"> - PH Paper • Plastic cups • Lemon juice <p>Supp. Resources Attached →</p>
<p>Assessment:</p>	<ul style="list-style-type: none"> • Teacher Observation • Weekly notebook & packet checks • Participation rubric checklist • Quiz - • Test - • Project - Attached
<p>Homework:</p>	<ul style="list-style-type: none"> • Weekly reflection - 1 page • Study notes

Waste, Away!

About two thirds of municipal solid waste ends up in a landfill. In this lab, you'll investigate how landfills are constructed to be most effective and safe.

Problem

How do different kinds of landfills work?

Skills Focus

making models, drawing conclusions

Materials

measuring cup	metric ruler	soil
small pebbles	cheesecloth	scissors
plastic wrap	water	newspaper
5 rubber bands	red food coloring	tweezers
heavy-duty plastic bag		
12 small sponge cubes		
3 transparent, wide-mouthed jars		

Procedure

1. Read over the rest of the procedure to preview the three landfill systems you will model. Determine which parts of the models represent potential drinking water, rainfall, solid waste, leachate, and the landfill systems themselves. Write a prediction about the way each system will respond to the test you'll conduct in Part 2.

Part 1 Modeling Three Landfill Systems

2. Obtain 3 identical jars. Label them *System 1*, *System 2*, and *System 3*. Pour clean, clear water into each jar to a depth of 5 cm.
3. Add equal amounts of small pebbles to each jar. The pebbles should be just below the surface of the water.



4. For *System 1*, cover the pebble and water mixture with 2.5 cm of soil.
5. For *System 2*, suspend a piece of cheesecloth in the jar about 5 cm above the water line, as shown in the photograph. Hold the cheesecloth in place with a rubber band around the outside mouth of the jar. Gently pour a handful of small pebbles into the cheesecloth.
6. For *System 3*, suspend a plastic bag in the jar about 5 cm above the water line. Hold the bag in place with a rubber band around the outside mouth of the jar. Gently pour a handful of small pebbles into the plastic bag.
7. Observe the water and pebbles at the bottom of each system. Record your observations.

Part 2 Testing the Systems

8. Soak 12 identical sponge cubes in water tinted with red food coloring. Use tweezers to place four soaked sponge cubes onto the top surface in each jar.
9. Cover the sponge cubes in *Systems 2* and *3* with a thin layer of soil. Leave the sponge cubes in *System 1* uncovered.

- ◆ In Steps 5 and 6, caution students to add the pebbles gently so they do not tear the cheesecloth and plastic.
- ◆ When students draw the systems in Step 10, they should label the following elements: *groundwater* (water at bottom of jar); *soil liner* (cheesecloth and plastic pieces); and *wash* (colored sponge cubes). Students could also label the pebbles *permeable layer*.

Expected Outcome

The groundwater in *Systems 1* and *2* will turn

red with "leachate"—food coloring from the sponge cubes. The water may also be cloudy with dissolved soil particles that have washed out of the landfills. The groundwater in *System 3* will remain clear, with all of the leachate contained by the plastic liner.

Analyze and Conclude

1. In *System 1*, an open dump, there is no barrier to separate waste from the soil and keep leachate from seeping into the groundwater. In *System 2*, a poorly designed landfill, the

10. Make a labeled drawing of each system. Explain what each part of the model represents.
11. Pour 150 mL of water over each system. Then cover each jar with plastic wrap, and hold the wrap in place with a rubber band. Let the systems stand overnight.
12. Observe each landfill system. Note especially any changes in the color or clarity of the "groundwater." Record your observations.

Analyze and Conclude

1. Explain how your models represent three common types of landfills: a well-designed, or sanitary, landfill; a landfill with a poor design; and an open dump. Compare the way the three systems work.
2. Which part of the model represented the leachate? How well did each landfill system protect the groundwater from the leachate?

3. Do you think a community's water supply is protected when waste is placed in landfills that are not immediately above groundwater sources? Explain.
4. **Apply** Based on your results, which landfill system is easiest for the environment? Explain your answer.

Design an Experiment

Solid waste can be compacted (crushed into smaller pieces) and have liquid removed before it is placed in a landfill. Does preparing the waste in this way make it safer for the environment? Write a hypothesis, then use the ideas and procedure from this lab to test your hypothesis. Obtain your teacher's permission before trying your experiment.



Chapter 4 E • 129

Program Resources

- ◆ **Teaching Resources** Real-World Lab Blackline masters, pp. 113–115

Media and Technology

- ▶ **Lab Activity Videotape**
Environmental Science, 8

Safety

Remind students to wear lab aprons and safety goggles and handle the glass jars carefully. Review the safety guidelines in Appendix A.